Übersetzungshilfe

(19) JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: **2000199906 A**

(43) Date of publication of application: **18.07.00**

(51) Int. Cl **G02F 1/1339**
G02F 1/13

(21) Application number: **10377153**

(22) Date of filing: **29.12.98**

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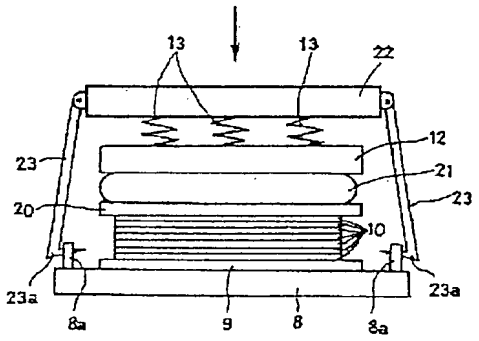
(54) **MANUFACTURING APPARATUS FOR LIQUID CRYSTAL ELEMENTS**

(57) Abstract:

PROBLEM TO BE SOLVED: To make surface pressure distribution of respective substrates uniform, even if there are variations in the pressurization distribution on a pressurizing means side.

SOLUTION: A pair of glass substrates holding a sealing material are formed as one set of a substrate body 10. Plural sets of the substrate bodies 10 are laminated and are arranged on a base plate 8. An auxiliary plate 20 is arranged on the substrate body 10 of the uppermost part and a pressure distributing member 21 including fluid is arranged between the auxiliary plate 20 and a pressurizing plate 12. The pressurizing plate 12 is pressurized via coil springs 13 by a pressurizing member 22 in this state. Accordingly, when the pressurizing plate 12 is pressurized, the substrate bodies 10 of the respective sets are pressurized via the pressure distributing member 21, and at this time, even if the variations in the pressurization distribution are induced on the pressurizing means side by factor, such as deformity and uneven contact of the pressurizing plate 12 and the change in the spring constants of the coil springs 13, the fluid in the pressure distributing member 21 flows according to the variations for absorbing the variations in the pressurization distribution, and therefore, the surface pressure distribution of the respective substrates 2 and 3 is made uniform.



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[Claim(s)]

[Claim 1] The sealant which forms the space for enclosing liquid crystal between the substrates of a couple is made to pinch between the substrates of said couple. As the substrate of these couples is made into 1 set and the substrate of 1 or more sets of said couples is piled up at least, make the outermost side of these substrates counter said pressurizing plate between pressurizing plates, and it arranges. By pressurizing the substrate of 1 or more sets of said couples by a force means through said pressurizing plate in this state The manufacturing installation of the liquid crystal device characterized by having arranged the pressure distribution member which connotes a fluid among the substrates of 1 or more sets of said couples between the outermost substrate and said pressurizing plate which counters this in the manufacturing installation of the liquid crystal device which joins the substrate of 1 or more sets of said couples through said sealant.

[Claim 2] The manufacturing installation of the liquid crystal device according to claim 1 characterized by having a heating means to form said sealant with thermosetting adhesive and to heat with the curing temperature of said sealant.

[Claim 3] Said fluid of said pressure distribution member is the manufacturing installation of the liquid crystal device according to claim 1 characterized by being the matter which has thermal resistance, such as silicone oil and silicone gel.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacturing installation of the liquid crystal device for joining the substrate of the couple of a liquid crystal device in more detail about the manufacturing installation of a liquid crystal device.

[0002]

[Description of the Prior Art] Conventionally, the liquid crystal device 1 forms the transparent electrode 4 and 5 in the transparent glass substrate 2 of a couple, and the opposed face of 3, respectively, as shown in drawing 2 . By forming the sealant 6 in the glass substrate 2 of these couples, and the periphery section between three, and joining

the glass substrate 2 of a couple, and 3 by this sealant 6, the glass substrate 2 of a couple and the space enclosed by the sealant 6 among three are formed, and it has composition which encloses liquid crystal 7 in this space. In this case, the sealant 6 consists of thermosetting adhesives, such as epoxy system resin.

[0003] In such a liquid crystal device 1, there are some which were constituted as the glass substrate 2 of a couple and 3 were shown in drawing 3 as a manufacturing installation for joining by the sealant 6, for example. That is, on the base plate 8 which is the pedestal of this manufacturing installation, the bottom elastic plate 9 which consists of heat-resistant rubber etc. is arranged. On this bottom elastic plate 9, the glass substrate 2 of a couple with which the sealant 6 intervened, and 3 are used as 1 set of board bodies 10, and two or more sets of 1 set of these board bodies 10 are laminated. On 1 set of this laminated topmost part of board bodies 10, the pressurizing plate 12 is arranged through the upside elastic plate 11 which consists of heat-resistant rubber etc., and the pressure portion material 14 is arranged through two or more coiled spring 13 on this pressurizing plate 12. In addition, this manufacturing installation is equipped with a heating means (not shown) to heat with the curing temperature of the sealant 6.

[0004] [this manufacturing installation] by pressurizing the pressurizing plate 12 through two or more coiled spring 13 by the pressure portion material 14 The glass substrate 2 of the couple of each class and 3 are joined at once by pressurizing at once two or more sets of board bodies 10 laminated through the upside elastic plate 11, heating by a heating means in this state, and stiffening the glass substrate 2 of the couple of each class, and the sealant 6 between three.

[0005]

[Problem(s) to be Solved by the Invention] however, [such a conventional manufacturing installation] The pressurizing plate 12 is pressurized through two or more coiled spring 13 by the pressure portion material 14. [with factors, such as deformation of the pressurizing plate 12 and change of the spring constant by degradation of per piece or the coiled spring 13,] when pressurizing at once two or more sets of board bodies 10 laminated through the upside elastic plate 11 If dispersion arises in the application-of-pressure distribution by the side of the force means of the pressure portion material 14, the coiled spring 13, etc. There is a problem that planar pressure distribution of the board body 10 of each class laminated in connection with this will become an ununiformity, and the glass substrate 2 of the couple of each class after heating and the gap G between three will become an ununiformity for this reason.

[0006] Even if the technical problem of this invention has dispersion in the application-of-pressure distribution by the side of a force means, it is planar pressure distribution of each substrate being made to homogeneity, and enabling it to form the gap between the substrates of a couple in homogeneity by this.

[0007]

[Means for Solving the Problem] This invention makes the sealant which forms the space for enclosing liquid crystal between the substrates of a couple pinch between the substrates of said couple. As the substrate of these couples is made into 1 set and the substrate of 1

or more sets of said couples is piled up at least, make the outermost side of these substrates counter said pressurizing plate between pressurizing plates, and it arranges. By pressurizing the substrate of 1 or more sets of said couples by a force means through said pressurizing plate in this state In the manufacturing installation of the liquid crystal device which joins the substrate of 1 or more sets of said couples through said sealant, it is characterized by having arranged the pressure distribution member which connotes a fluid among the substrates of 1 or more sets of said couples between the outermost substrate and said pressurizing plate which counters this. Since the pressure distribution member which connotes a fluid among the substrates of 1 or more sets of couples between the outermost substrate and the pressurizing plate which counters this has been arranged according to this invention When a pressurizing plate is pressurized by a force means, it will be pressurized by the substrate of 1 or more sets of couples through a pressure distribution member, and at this time For example, even if dispersion arises in application-of-pressure distribution with deformation of a pressurizing plate and factors, such as per piece, at the force means side, in order for the fluid in a pressure distribution member to flow according to the dispersion and to absorb dispersion in application-of-pressure distribution, Planar pressure distribution of each substrate can be made into homogeneity, and, thereby, the gap between the substrates of a couple can be formed in homogeneity.

[0008] In this case, by having a heating means to form a profit according to claim 2 and a sealant with thermosetting adhesive, and to heat with the curing temperature of this sealant After it pressurized by the force means and the pressure distribution member has maintained planar pressure distribution of each substrate at homogeneity, it can heat with the curing temperature of a sealant by a heating means, a sealant can be stiffened, and, for this reason, the gap between the substrates of a couple can be formed in homogeneity with a sufficient precision. When [moreover,] the fluid of a profit according to claim 3 and a pressure distribution member is the matter which has thermal resistance, such as silicone oil and silicone gel Even if it pressurizes each substrate by a force means and heats by a heating means in this state at the curing temperature of a sealant, there is almost no pressure variation by the thermal expansion of a fluid, and, for this reason, it can pressurize by the about 1 constant-pressure force during heating.

[0009]

[Embodiment of the Invention] With reference to drawing 1 , one embodiment of the manufacturing installation of the liquid crystal device of this invention is explained hereafter. In addition, the same sign is given to the same part as the conventional parallel shown in drawing 2 and drawing 3 , and the explanation is omitted. Drawing 1 is the front view having shown the manufacturing installation of the liquid crystal device. On the base plate 8 (it is equivalent to one pressurizing plate) which is a pedestal in this drawing Like the 1st embodiment, the bottom elastic plate 9 is arranged, on this bottom elastic plate 9, the glass substrate 2 of a couple with which the sealant 6 intervened, and 3 are used as 1 set of board bodies 10, and two or more sets of 1 set of these board bodies 10 are laminated. On 1 set of this laminated topmost part of board bodies 10, the pressure distribution member 21 is arranged through the auxiliary plate 20. The pressure distribution member 21 has the

composition of having connoted the fluid free [floating] in the saccate package inside of the body. A fluid has a fluidity, and also has thermal resistance, and consists of matter, such as silicone oil and silicone gel, for example, and the heat-resistant temperature is [pressure resistance] about two 0.4 kg/cm at about 180 degrees C. In addition, the auxiliary plate 20 has prevented the space where it is monotonous, and is formed more greatly than the glass substrate 2 of each class and the size of 3, and the glass substrate 2 of a couple and the liquid crystal 7 in 3 which have rigidity are enclosed, and a corresponding part bending by the pressure distribution member 21.

[0010] Moreover, like the 1st embodiment, the pressurizing plate 12 (it is equivalent to the pressurizing plate of another side) is arranged, and the pressure portion material 22 is arranged through two or more coiled spring 13 on this pressurizing plate 12 at the pressure distribution member 21 top. In this case, the clamp arm 23 is attached to the both ends of the pressure portion material 22 rotatable, respectively. [these clamp arm 23] when the pressure portion material 22 pressurizes the pressurizing plate 12 through two or more coiled spring 13 and becomes a constant pressure The hook section 23a of the soffit section of each clamp arm 23 engages with the catching part 8a prepared on the base plate 8, and it is constituted so that this may maintain the application-of-pressure state of a constant pressure. In addition, this manufacturing installation is held in a heating furnace (not shown) with an application-of-pressure state, and when the curing temperature 6 of the sealant 6, for example, a sealant, is epoxy system resin, it is heated at about 140 degrees C.

[0011] [the state where used as 1 set of board bodies 10 the glass substrate 2 of a couple with which the sealant 6 intervened, and 3 in the manufacturing installation of such a liquid crystal device, and two or more sets of 1 set of these board bodies 10 were made to laminate] It arranges between the bottom elastic plate 9 on a base plate 8, and the auxiliary plate 20. If the pressure distribution member 21 is arranged between this auxiliary plate 20 and pressurizing plate 12 and the pressurizing plate 12 is pressurized through two or more coiled spring 13 by the pressure portion material 14 in this state, two or more sets of board bodies 10 laminated through the pressure distribution member 21 and the auxiliary plate 20 will be pressurized. [with factors, such as deformation of the pressurizing plate 12 and change of the spring constant by degradation of per piece or the coiled spring 13,] at this time Even if dispersion arises in application-of-pressure distribution at the force means side of the pressure portion material 22, the coiled spring 13, etc., in order for the fluid in the pressure distribution member 21 to flow according to the dispersion and to absorb dispersion in application-of-pressure distribution, The planar pressure distribution 2 of two or more sets of laminated board bodies 10, i.e., the glass substrate of each class, and planar pressure distribution of 3 can be made into homogeneity.

[0012] Thus, when two or more sets of laminated board bodies 10 are pressurized and it becomes a constant pressure, the hook section 23a of each clamp arm 23 of the pressure portion material 22 will be stopped by the catching part 8a of a base plate 8, and the state where two or more board bodies 10 of the group were pressurized by the constant pressure by this will be maintained. And it holds in a heating furnace with this state, it heats in this

heating furnace with the curing temperature (for example, about 140 degrees C) of the sealant 6, and the sealant 6 is stiffened. Since the fluid of the pressure distribution member 21 consists of silicone oil, silicone gel, etc. which have thermal resistance at this time, the heat-resistant temperature is about 180 degrees C and the pressure variation by the thermal expansion of a fluid hardly arises, Planar pressure distribution of two or more sets of board bodies 10 which could maintain the application-of-pressure state of the about 1 constant-pressure force during heating, and were laminated by the pressure distribution member 21 also in heating for this reason is uniform. And the glass substrate 2 of each class and the sealant 6 between three can be stiffened with the application-of-pressure state of a constant pressure maintained, and, thereby, the glass substrate 2 of a couple and the gap G between three can be formed in homogeneity with a sufficient precision.

[0013] In addition, in the above-mentioned embodiment between the bottom elastic plate 9 on a base plate 8, and the auxiliary plate 20 by the side of the pressurizing plate 12 Although the case where made the glass substrate 2 of a couple with which the sealant 6 intervened, and two or more sets of board bodies 10 which make 3 1 set laminate, and two or more sets of these laminated board bodies 10 were pressurized at once was described Not only this but 1 set of the glass substrate 2 of a couple with which the sealant 6 intervened, for example and 3 are arranged, and you may make it pressurize it. Moreover, in the above-mentioned embodiment, although the matter of a silicone system was used as a fluid of the pressure distribution member 21, as long as it has not only this but thermal resistance, you may use fine particles, such as liquids, such as oil, semisolids, such as grease, and particles, etc., for example.

[0014] Moreover, although the glass substrate 2 and 3 were used as a substrate of the couple of the liquid crystal device 1 in the above-mentioned embodiment Although the transparent film which consists not only of this but of synthetic resin could be used and epoxy adhesive was used as a sealant 6, you may use photo-setting resins, such as not only this but ultraviolet-rays hardenability resin. In this case, what is necessary is just to use the Mitsuteru gunner stage which replaces with a heating means and irradiates light, such as ultraviolet rays. Furthermore, although the pressure portion material 14 is the composition which pressurizes the pressurizing plate 12 through two or more coiled spring 13 as a force means in the above-mentioned embodiment, you may be the load plate of specified weight, for example not only this but, and actuators, such as an oil hydraulic cylinder, may be used.

[0015]

[Effect of the Invention] As explained above, according to this invention, the substrate of the couple which pinched the sealant is made into 1 set. As the substrate of at least 1 or more sets of couples is piled up, when arranging between pressurizing plates, Since the pressure distribution member which connotes a fluid among the substrates of 1 or more sets of couples between the outermost substrate and the pressurizing plate which counters this has been arranged When a pressurizing plate is pressurized by a force means, it will be pressurized by the substrate of 1 or more sets of couples through a pressure distribution member, and at this time For example, even if dispersion arises in application-of-pressure

distribution with deformation of a pressurizing plate and factors, such as per piece, at the force means side, in order for the fluid in a pressure distribution member to flow according to the dispersion and to absorb dispersion in application-of-pressure distribution, Planar pressure distribution of each substrate can be made into homogeneity, and, thereby, the gap between the substrates of a couple can be formed in homogeneity. After [in this case,] it pressurized by the force means and the pressure distribution member has maintained planar pressure distribution of each substrate at homogeneity by having a heating means to form a sealant with thermosetting adhesive and to heat with the curing temperature of this sealant It can heat with the curing temperature of a sealant by a heating means, a sealant can be stiffened, and, for this reason, the gap between the substrates of a couple can be formed in homogeneity with a sufficient precision. When [moreover,] the fluid of a pressure distribution member is the matter which has thermal resistance, such as silicone oil and silicone gel Even if it pressurizes each substrate by a force means and heats by a heating means in this state at the curing temperature of a sealant, there is almost no pressure variation by the thermal expansion of a fluid, and, for this reason, it can pressurize by the about 1 constant-pressure force during heating.

[Brief Description of the Drawings]

[Drawing 1] The front view having shown one embodiment of the manufacturing installation of the liquid crystal device of this invention.

[Drawing 2] The expanded sectional view of a liquid crystal device.

[Drawing 3] The front view having shown the manufacturing installation of the conventional liquid crystal device.

[Description of Notations]

1 Liquid Crystal Device

2, 3 Glass substrate

6 Sealant

8 Base Plate

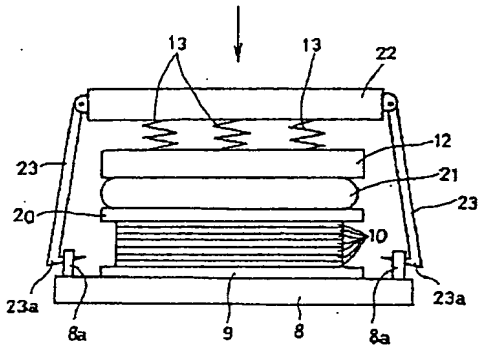
12 Pressurizing Plate

13 Coiled Spring

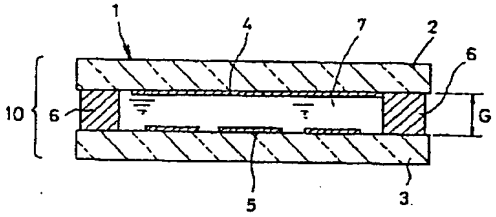
21 Pressure Distribution Member

22 Pressure Portion Material

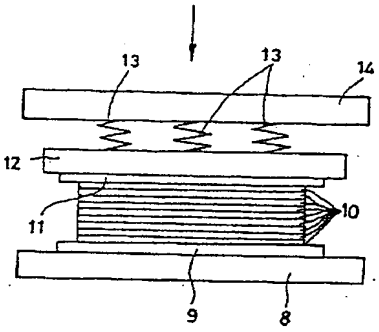
[Drawing 1]



[Drawing 2]



[Drawing 3]



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(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号
特開2000－199906
（P2000－199906A）
(43)公開日　平成12年７月18日(2000.7.18)

(51)Int.Cl.⁷		識別記号	FI			テーマコード(参考)
Ｇ０２Ｆ	1/1339	５０５	Ｇ０２Ｆ	1/1339	５０５	２Ｈ０８８
	1/13	１０１		1/13	１０１	２Ｈ０８９

審査請求　未請求　請求項の数３　ＦＤ　（全　４　頁）

(21)出願番号　特願平10－377153

(22)出願日　平成10年12月29日(1998.12.29)

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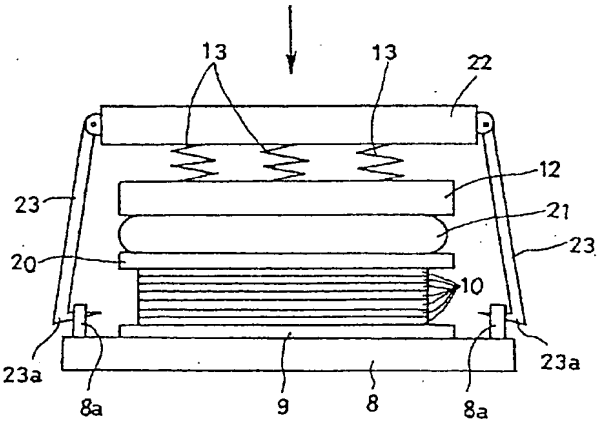
Ｆターム(参考)　2H088 FA01 FA20 FA30 MA17
2H089 NA45 NA48 NA60 QA14

(54)【発明の名称】　液晶素子の製造装置

(57)【要約】
【課題】　加圧手段側に加圧分布のばらつきがあっても、各基板の面圧分布を均一にする。
【解決手段】　シール材を挟持した一対のガラス基板を１組の基板体１０とし、この基板体１０を複数組積層させてベースプレート８上に配置し、その最上部の基板体１０上に補助プレート２０を配置し、この補助プレート２０と加圧プレート１２との間に流動体を内包してなる圧力分散部材２１を配置し、この状態で加圧部材２２によりコイルばね１３を介して加圧プレート１２を加圧する。従って、加圧プレート１２が加圧されると、圧力分散部材２１を介して各組の基板体１０が加圧され、このときに加圧プレート１２の変形や片当たり、またはコイルばね１３のばね定数の変化などの要因により、加圧手段側に加圧分布のばらつきが生じても、そのばらつきに応じて圧力分散部材２１内の流動体が流動して加圧分布のばらつきを吸収するため、各基板２、３の面圧分布を均一にできる。



【特許請求の範囲】

【請求項１】一対の基板間に液晶を封入するための空間を形成するシール材を前記一対の基板間に挟持させ、これら一対の基板を１組とし、少なくとも前記１組以上の一対の基板を重ね合わせるようにして加圧プレート間にそれら基板の最外面を前記加圧プレートに対向させて配置し、この状態で前記加圧プレートを介して前記１組以上の一対の基板を加圧手段で加圧することにより、前記１組以上の一対の基板を前記シール材を介して接合する液晶素子の製造装置において、

前記１組以上の一対の基板のうち、最外部の基板とこれに対向する前記加圧プレートとの間に、流動体を内包してなる圧力分散部材を配置したことを特徴とする液晶素子の製造装置。

【請求項２】前記シール材を熱硬化性接着剤で形成し、前記シール材の硬化温度で加熱する加熱手段を備えていることを特徴とする請求項１記載の液晶素子の製造装置。

【請求項３】前記圧力分散部材の前記流動体は、シリコーンオイルやシリコーンゲルなどの耐熱性を有する物質であることを特徴とする請求項１記載の液晶素子の製造装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、液晶素子の製造装置に関し、更に詳しくは液晶素子の一対の基板を接合させるための液晶素子の製造装置に関する。

【０００２】

【従来の技術】従来、液晶素子１は、図２に示すように、一対の透明なガラス基板２、３の対向面にそれぞれ透明電極４、５を形成し、これら一対のガラス基板２、３間における周縁部にシール材６を設け、このシール材６により一対のガラス基板２、３を接合することにより、一対のガラス基板２、３間にシール材６で囲われた空間を形成し、この空間内に液晶７を封入する構成になっている。この場合、シール材６は、エポキシ系樹脂などの熱硬化性接着剤からなっている。

【０００３】このような液晶素子１において、一対のガラス基板２、３をシール材６で接合するための製造装置としては、例えば、図３に示すように構成されたものがある。すなわち、この製造装置の基台であるベースプレート８上には、耐熱ゴムなどからなる下側弾性板９が配置されている。この下側弾性板９上には、シール材６が介在された一対のガラス基板２、３を１組の基板体１０とし、この１組の基板体１０が複数組積層される。この積層された最上部の１組の基板体１０上には、耐熱ゴムなどからなる上側弾性板１１を介して加圧プレート１２が配置されており、この加圧プレート１２上には、複数のコイルばね１３を介して加圧部材１４が配置されている。なお、この製造装置は、シール材６の硬化温度で加熱する加熱手段（図示せず）を備えている。

【０００４】この製造装置では、加圧部材１４により複数のコイルばね１３を介して加圧プレート１２を加圧することにより、上側弾性板１１を介して積層された複数組の基板体１０を一度に加圧し、この状態で加熱手段により加熱して各組の一対のガラス基板２、３間のシール材６を硬化させることにより、各組の一対のガラス基板２、３を一度に接合している。

【０００５】

【発明が解決しようとする課題】しかしながら、このような従来の製造装置では、加圧部材１４により複数のコイルばね１３を介して加圧プレート１２を加圧し、上側弾性板１１を介して積層された複数組の基板体１０を一度に加圧する際、加圧プレート１２の変形や片当たり、あるいはコイルばね１３の劣化によるばね定数の変化などの要因により、加圧部材１４およびコイルばね１３などの加圧手段側における加圧分布にばらつきが生じると、これに伴って積層された各組の基板体１０の面圧分布が不均一になり、このため加熱後における各組の一対のガラス基板２、３間のギャップＧが不均一になってしまうという問題がある。

【０００６】この発明の課題は、加圧手段側の加圧分布にばらつきがあっても、各基板の面圧分布を均一にでき、これにより一対の基板間のギャップを均一に形成できるようにすることである。

【０００７】

【課題を解決するための手段】この発明は、一対の基板間に液晶を封入するための空間を形成するシール材を前記一対の基板間に挟持させ、これら一対の基板を１組とし、少なくとも前記１組以上の一対の基板を重ね合わせるようにして加圧プレート間にそれら基板の最外面を前記加圧プレートに対向させて配置し、この状態で前記加圧プレートを介して前記１組以上の一対の基板を加圧手段で加圧することにより、前記１組以上の一対の基板を前記シール材を介して接合する液晶素子の製造装置において、前記１組以上の一対の基板のうち、最外部の基板とこれに対向する前記加圧プレートとの間に、流動体を内包してなる圧力分散部材を配置したことを特徴とする。この発明によれば、１組以上の一対の基板のうち、最外部の基板とこれに対向する加圧プレートとの間に流動体を内包してなる圧力分散部材を配置したので、加圧手段により加圧プレートを加圧すると、圧力分散部材を介して１組以上の一対の基板が加圧されることになり、このときに、例えば加圧プレートの変形や片当たりなどの要因により、加圧手段側において加圧分布にばらつきが生じても、そのばらつきに応じて圧力分散部材内の流動体が流動して加圧分布のばらつきを吸収するため、各基板の面圧分布を均一にすることができ、これにより一対の基板間のギャップを均一に形成することができる。

【０００８】この場合、請求項２に記載のごとく、シー

ル材を熱硬化性接着剤で形成し、このシール材の硬化温度で加熱する加熱手段を備えていることにより、加圧手段で加圧して圧力分散部材により各基板の面圧分布を均一に保った状態で、加熱手段によりシール材の硬化温度で加熱してシール材を硬化させることができ、このため一対の基板間のギャップを精度良く均一に形成できる。また、請求項３に記載のごとく、圧力分散部材の流動体がシリコーンオイルやシリコーンゲルなどの耐熱性を有する物質であることにより、加圧手段で各基板を加圧し、この状態で加熱手段によりシール材の硬化温度で加熱しても、流動体の熱膨張による圧力変化がほとんどなく、このため加熱中においてもほぼ一定圧力で加圧することができる。

【０００９】

【発明の実施の形態】以下、図１を参照して、この発明の液晶素子の製造装置の一実施形態について説明する。なお、図２および図３に示された従来例と同一部分には同一符号を付し、その説明は省略する。図１は液晶素子の製造装置を示した正面図である。この図において、基台であるベースプレート８（一方の加圧プレートに相当する）上には、第１実施形態と同様、下側弾性板９が配置されており、この下側弾性板９上には、シール材６が介在された一対のガラス基板２、３を１組の基板体１０とし、この１組の基板体１０が複数組積層される。この積層された最上部の１組の基板体１０上には、補助プレート２０を介して圧力分散部材２１が配置されている。圧力分散部材２１は、袋状の包装体内に流動体を流動自在に内包した構成になっている。流動体は、流動性を有するほかに、耐熱性をも有するもので、例えばシリコーンオイルやシリコーンゲルなどの物質からなり、その耐熱温度が１８０℃程度で、耐圧力が０．４Ｋｇ／ｃｍ^{2}程度のものである。なお、補助プレート２０は、剛性を有する平板で、各組のガラス基板２、３のサイズよりも大きく形成され、かつ一対のガラス基板２、３における液晶７が封入される空間と対応する部分が圧力分散部材２１によって撓むのを防いでいる。

【００１０】また、圧力分散部材２１上には、第１実施形態と同様、加圧プレート１２（他方の加圧プレートに相当する）が配置されており、この加圧プレート１２上には、複数のコイルばね１３を介して加圧部材２２が配置されている。この場合、加圧部材２２の両端部には、それぞれクランプアーム２３が回動可能に取り付けられている。これらクランプアーム２３は、加圧部材２２が複数のコイルばね１３を介して加圧プレート１２を加圧して一定圧力になったときに、各クランプアーム２３の下端部のフック部２３ａがベースプレート８上に設けられた係合部８ａに係合し、これにより一定圧力の加圧状態を保つように構成されている。なお、この製造装置は、加圧状態のままで加熱炉（図示せず）内に収容され、シール材６の硬化温度、例えばシール材６がエポキシ系樹脂の場合、約１４０℃で加熱される。

【００１１】このような液晶素子の製造装置では、シール材６が介在された一対のガラス基板２、３を１組の基板体１０とし、この１組の基板体１０を複数組積層させた状態で、ベースプレート８上の下側弾性板９と補助プレート２０との間に配置し、この補助プレート２０と加圧プレート１２との間に圧力分散部材２１を配置し、この状態で加圧部材１４により複数のコイルばね１３を介して加圧プレート１２を加圧すると、圧力分散部材２１および補助プレート２０を介して積層された複数組の基板体１０が加圧される。このとき、加圧プレート１２の変形や片当たり、あるいはコイルばね１３の劣化によるばね定数の変化などの要因により、加圧部材２２およびコイルばね１３などの加圧手段側において加圧分布にばらつきが生じても、そのばらつきに応じて圧力分散部材２１内の流動体が流動して加圧分布のばらつきを吸収するため、積層された複数組の基板体１０の面圧分布、つまり各組のガラス基板２、３の面圧分布を均一にすることができる。

【００１２】このようにして、積層された複数組の基板体１０が加圧されて一定圧力になると、加圧部材２２の各クランプアーム２３のフック部２３ａがベースプレート８の係合部８ａに係止され、これにより複数組の基板体１０が一定圧力で加圧された状態を保つことになる。そして、この状態のまま加熱炉内に収容し、この加熱炉内でシール材６の硬化温度（例えば約１４０℃）で加熱してシール材６を硬化させる。このときには、圧力分散部材２１の流動体が耐熱性を有するシリコーンオイルやシリコーンゲルなどからなり、耐熱温度が１８０℃程度であるから、流動体の熱膨張による圧力変化がほとんど生じないため、加熱中においてもほぼ一定圧力の加圧状態を保つことができ、このため加熱中でも圧力分散部材２１により積層された複数組の基板体１０の面圧分布が均一で、かつ一定圧力の加圧状態を保ったままで各組のガラス基板２、３間のシール材６を硬化させることができ、これにより一対のガラス基板２、３間のギャップＧを精度良く均一に形成することができる。

【００１３】なお、上記実施形態では、ベースプレート８上の下側弾性板９と加圧プレート１２側の補助プレート２０との間に、シール材６が介在された一対のガラス基板２、３を１組とする基板体１０を複数組積層させ、この積層された複数組の基板体１０を一度に加圧する場合について述べたが、これに限らず、例えば、シール材６が介在された一対のガラス基板２、３を１組だけ配置して加圧するようにしても良い。また、上記実施形態では、圧力分散部材２１の流動体として、シリコーン系の物質を用いたが、これに限らず、耐熱性を有するものであれば、例えばオイルなどの液体や、グリースなどの半固体、粒子などの粉体などを用いても良い。

【００１４】また、上記実施形態では、液晶素子１の一

対の基板として、ガラス基板２、３を用いたが、これに限らず、合成樹脂からなる透明なフィルムを用いても良く、またシール材６として、エポキシ系接着剤を用いたが、これに限らず、紫外線硬化性樹脂などの光硬化性樹脂を用いても良い。この場合には、加熱手段に代えて紫外線などの光を照射する光照射手段を用いれば良い。さらに、上記実施形態では、加圧手段として、加圧部材１４が複数のコイルばね１３を介して加圧プレート１２を加圧する構成であるが、これに限らず、例えば、所定重量の荷重板であってもよく、また油圧シリンダなどのアクチュエータを用いても良い。

【００１５】

【発明の効果】以上説明したように、この発明によれば、シール材を挟持した一対の基板を１組とし、少なくとも１組以上の一対の基板を重ね合わせるようにして加圧プレート間に配置する際、１組以上の一対の基板のうち、最外部の基板とこれに対向する加圧プレートとの間に流動体を内包してなる圧力分散部材を配置したので、加圧手段により加圧プレートを加圧すると、圧力分散部材を介して１組以上の一対の基板が加圧されることになり、このときに、例えば加圧プレートの変形や片当たりなどの要因により、加圧手段側において加圧分布にばらつきが生じても、そのばらつきに応じて圧力分散部材内の流動体が流動して加圧分布のばらつきを吸収するため、各基板の面圧分布を均一にすることができ、これにより一対の基板間のギャップを均一に形成することができる。この場合、シール材を熱硬化性接着剤で形成し、＊このシール材の硬化温度で加熱する加熱手段を備えていることにより、加圧手段で加圧して圧力分散部材により各基板の面圧分布を均一に保った状態で、加熱手段によりシール材の硬化温度で加熱してシール材を硬化させることができ、このため一対の基板間のギャップを精度良く均一に形成できる。また、圧力分散部材の流動体がシリコーンオイルやシリコーンゲルなどの耐熱性を有する物質であることにより、加圧手段で各基板を加圧し、この状態で加熱手段によりシール材の硬化温度で加熱しても、流動体の熱膨張による圧力変化がほとんどなく、このため加熱中においてもほぼ一定圧力で加圧することができる。

【図面の簡単な説明】

【図１】この発明の液晶素子の製造装置の一実施形態を示した正面図。

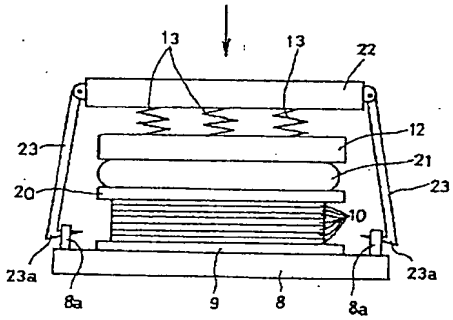
【図２】液晶素子の拡大断面図。

【図３】従来の液晶素子の製造装置を示した正面図。

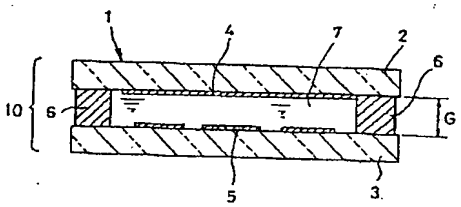
【符号の説明】

１　液晶素子
２、３　ガラス基板
６　シール材
８　ベースプレート
１２　加圧プレート
１３　コイルばね
２１　圧力分散部材
２２　加圧部材

【図１】



【図２】



【図３】